

Procedure how to assemble the WAB

General Notes

- Please read the section of this document you are going to work on today BEFORE you start the work and remember as much as possible. Because the some of the work does not give you time to read this document.

- Clean the clean room everyday.
- Take the log. Leave them on k-log.
- Take many pictures. Leave them on k-log.
- Fix the suspension and cover it when you leave, and when you open the top window of the clean booth.
- When you moved tools, circuits, and so on, which belongs to the other subsystems, please make the log, and be sure to return it when finished. Especially, the information about where the circuits is necessary to be updated on the JGW doc DB.
- Take enough rest. If you feel tired, do not hesitate to go outside and take a rest.
- Wear proper items if necessary (safety gloves, helmets,,)
- You need two people who have crane licenses when you use the crane.
- If you got injured, please tell the responsibility person as soon as possible.
- When you work around/inside the vacuum chamber, wear clean inner wears and class-1 clean wear, which is the blue ones or ones with separated hood. And blow the air to remove your dust when you enter the clean room.
- Bring the clean suits outside for cleaning every Friday. After you brought them to the office, count the number of the suits w/ hood, suits w/o hood, hood, mask, gloves, and shoes.

Drawings

Should be found in the JGW document server (Author: Obuchi-san).

List of Items

- BASE PLATE (1x)
- BASE PLATE SIDE + MIRROR (→ 2x)
- BASE PLATE STIFFENER (2x)
- SUSPENSION SUPPORT STRUCTURE PLATE (1x)
- SUSPENSION SUPPORT STRUCTURE BEAM STIFFENER (4x)
- SUSPENSION EQ STOP PLATE (2x)
- SUSPENSION SUPPORT STRUCTURE BEAM (2x)
- SUSPENSION EQ STOP ROD (8x)
- BAFFLE (1x)
- BAFFLE FLANGE (2x)
- BAFFLE FLANGE DISTANCE SPACER (4x)
- BAFFLE WING PLATE (4x)
- BAFFLE FLANGE RETAINER PIN (2x)
- BAFFLE FLANGE RETAINER PIN THREADED (2x)
- SUSPENSION DAMPER PLATE (4x)
- SUSPENSION PLATFORM PLATE STIFFENER (2x)
- SUSPENSION PLATFORM (1x)
- SUSPENSION YAW ADJUSTER BOSS BLOCK (1x)
- SUSPENSION Z-STAGE TOP PLATE (1x)
- SUSPENSION Z-STAGE BOTTOM PLATE (1x)
- SUSPENSION X-Y TRANSLATOR STAGE (1x)
- SUSPENSION BLADE SPRING ANCHOR BLOCK (1x)
- SUSPENSION BLADE SPRING (2x)
- SUSPENSION BLADE SPRING RETAINER PLATE (2x)
- SUSPENSION DAMPER T-BEAM (2x)
- SUSPENSION DAMPER PLATE SPRING (4x)
- SUSPENSION DAMPER PLATE SPRING RETAINER (4x)
- SUSPENSION DAMPER PLATE SPRING RETAINER THREADED (4x)
- SUSPENSION DAMPER MOUNT BRACKET (2x)
- SUSPENSION DAMPER MAGNET BASE PLATE (4x)

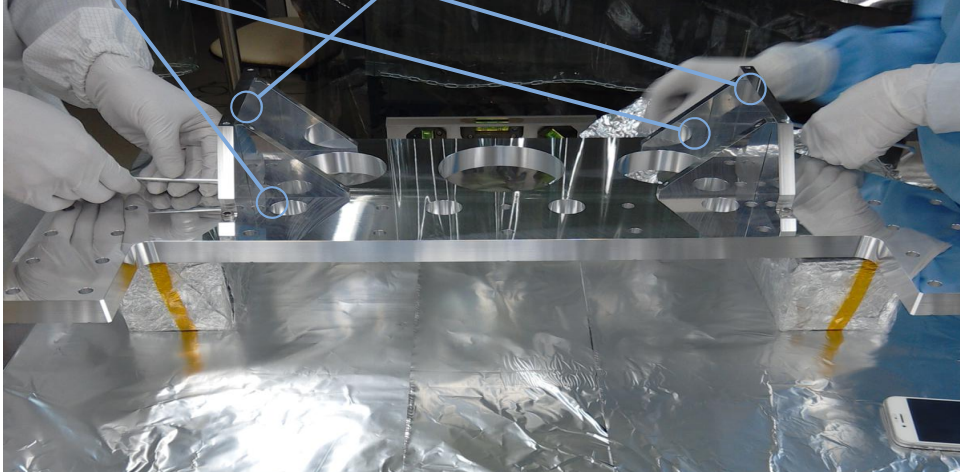
- SUSPENSION DAMPER MAGNET (> 8x)
- * JIG SHIPPING LOCK SHIELD PLATE (2x)
- * JIG SHIPPING LOCK T BRACKET (2x)
- * BAFFLE SHIPPING LOCK BRACKET A (2x)
- * JIG WIRE ASSEMBLY TOOL HANDLING PLATE (1x)
- * JIG WIRE ASSEMBLY TOOL BRACKET C (1x)
- * JIG WIRE ASSEMBLY TOOL BASE PLATE (1x)
- * JIG WIRE ASSEMBLY TOOL BRACKET B (1x)
- * SUSPENSION WIRE (4x)
- * SUSPENSION WIRE ANCHOR + MIRROR (→ 4x)
- * SUSPENSION WIRE ANCHOR Y-BRACKET (2x)
- * SUSPENSION WIRE ANCHOR RETAINER (2x)
- * BAFFLE WIRE ANCHOR WASHER (4x)
- * M6
- * M5
- * M4
- * M3
- CBSTSR2.5-4 (8x)
- SFBJ2.5-6 (8x)
- * SUSPENSION Z-STAGE JACK SCREW (3x)

Check-List

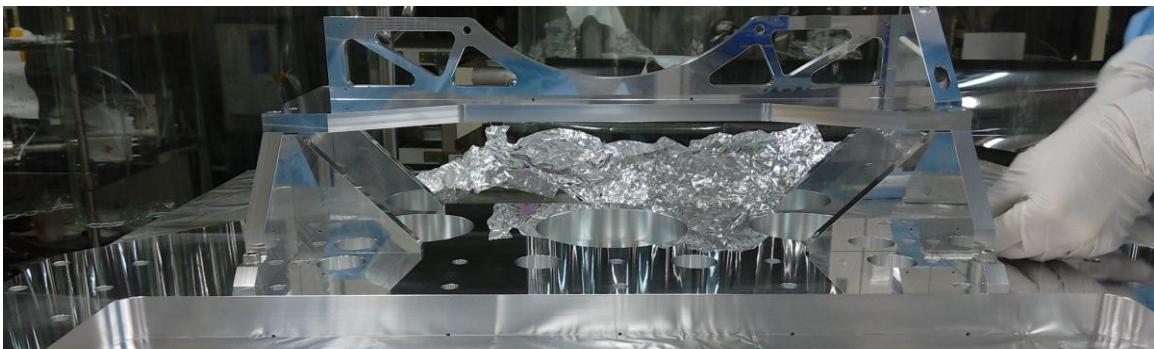
Detailed Description

1. Suspension Base (2 Persons)

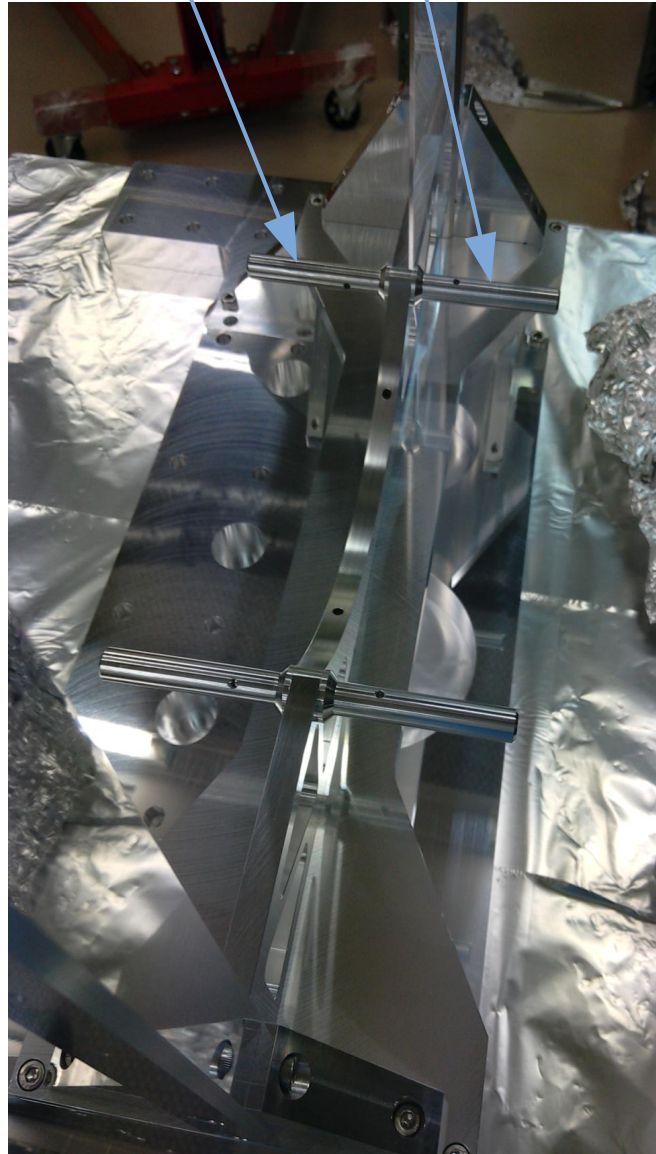
- On the prepared table, first set the base plate in a 90° angle on its front-side* and screw the base plate sides on it from the bottom of the base plate.
- Set the base plate to its nominal position and screw the base plate sides also from top.
- Screw the base plate stiffener to the base plate sides



- Put the suspension support structure plate on the base plate sides and screw it tight.
- Put the suspension EQ stop plate and the suspension support structure beam stiffener on the suspension support structure plate; screw the stiffeners and the stop-plate (from bottom of the structure-plate) but do not tighten the screws.



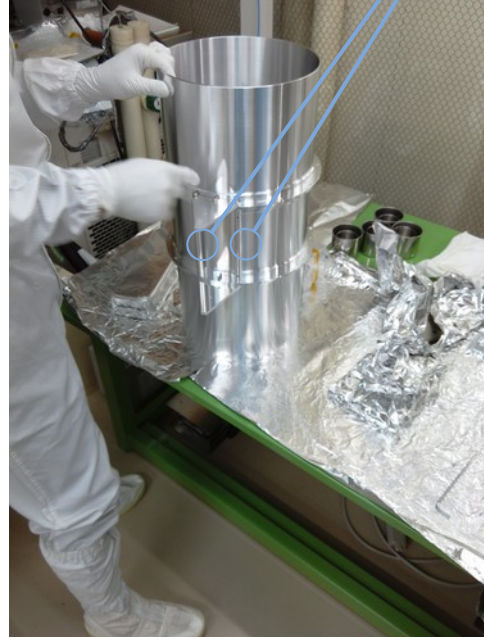
- Put the suspension support structure beams between the stiffener and the stop-plate and screw them together; start tighten all screws
- Set two pairs of suspension EQ stop rods on the stop-plate by first inserting a FABBS6x30 into one rod, then inserting the open-end of the FABBS6x30 through the respective holes in the stop-plate, and lastly screwing and tightening the other rod on that open-end.



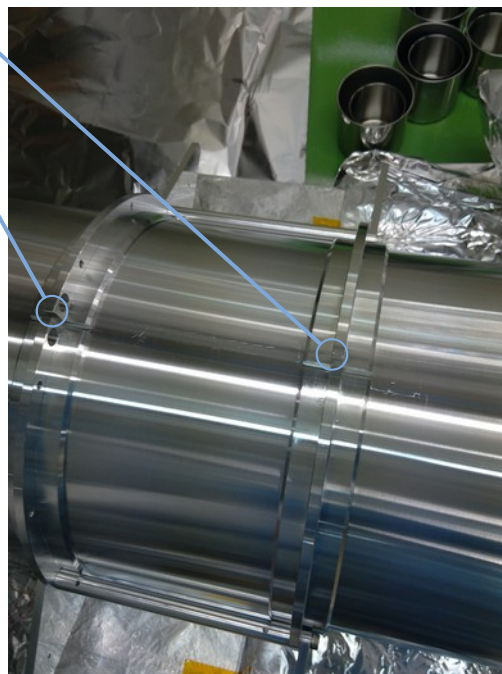
2. Baffle Preparation (1-2 Persons)

- Set the baffle in an upward position and pull a baffle flange from top of the baffle over it toward the flange assembly's lower position (should be indicated by a line*)
- screw the baffle flange distance spacer on the (now) lower flange and tighten the screws
- Pull another flange over the top of the baffle until the position destined by the spacers is reached

Note: pulling the flange over the baffle can be very tight; scratching seems almost unavoidable*...



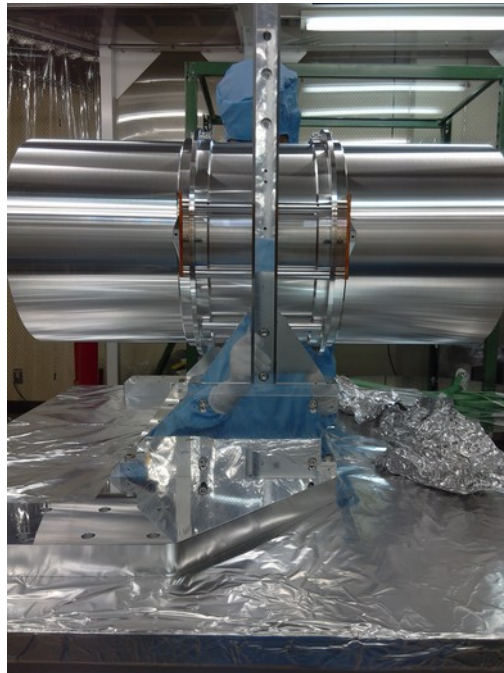
- Mount the baffle wing plates on each side of the flanges
- Set the baffle flange retainer pin and the baffle flange retainer pin threaded on each side of the open end of the flanges and fix them with two M5x20* screws; tighten them carefully and symmetrically with respect to the flanges



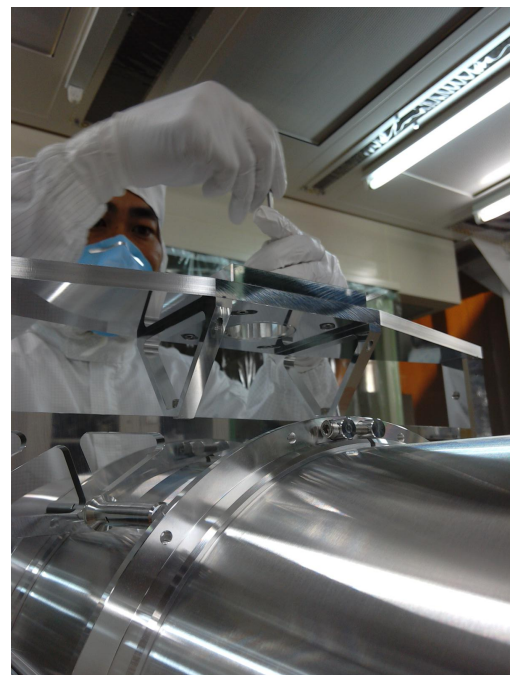
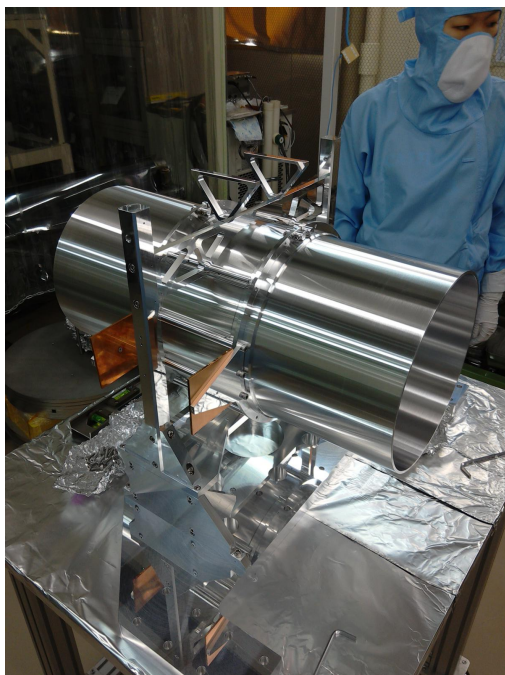
- Mount the suspension damper plates on each baffle wing plate with a nonmagnetic screw*

3. Insert Baffle and Suspension Roof (2 Persons)

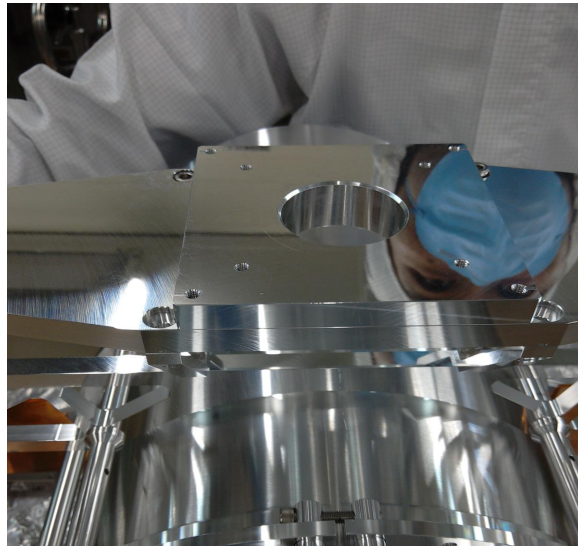
- Set the baffle inside the (half) assembled suspension structure so that the EQ stop rods keep it in position (if properly set, the rods may be even not necessary for that)



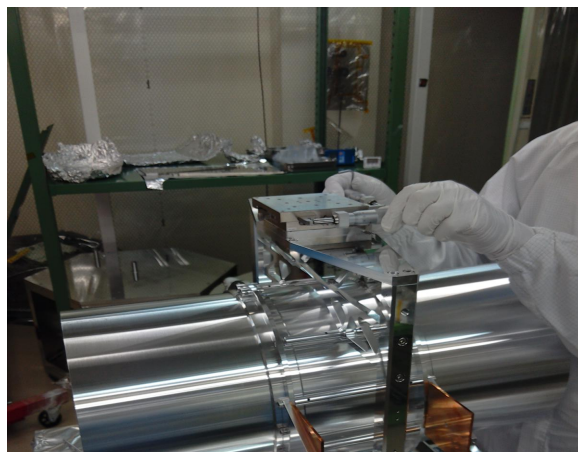
- Set the upper suspension EQ stop-plate in between the two suspension support structure beams and screw it to them (do not tighten yet!)
- Mount the two Suspension Platform Plate Stiffeners on the upper suspension EQ stop-plate by using the respective screw holes on the stop-plate (M4?)
- Set the Suspension Platform Plate on the top of the suspension support structure beams and the Suspension Platform Plate Stiffeners alike; Screw them tight



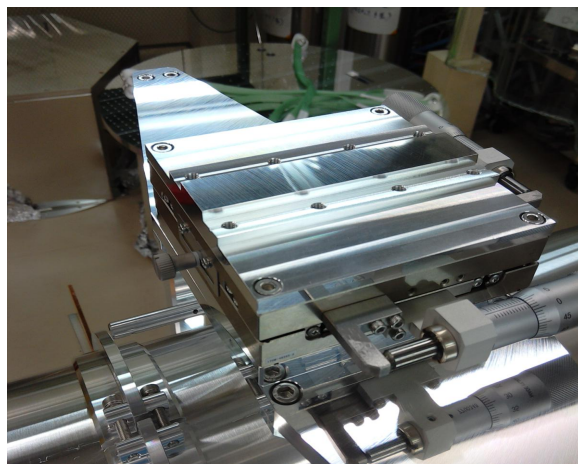
- Set the Suspension Yaw Adjuster Boss Block onto the Suspension Platform Plate (screw it from the bottom of the platform-plate)



- Mount the X-Y translator stage on the Suspension Yaw Adjuster Boss Block with M4 screws



- Mount the Suspension Blade Spring Anchor Block on the X-Y translator stage



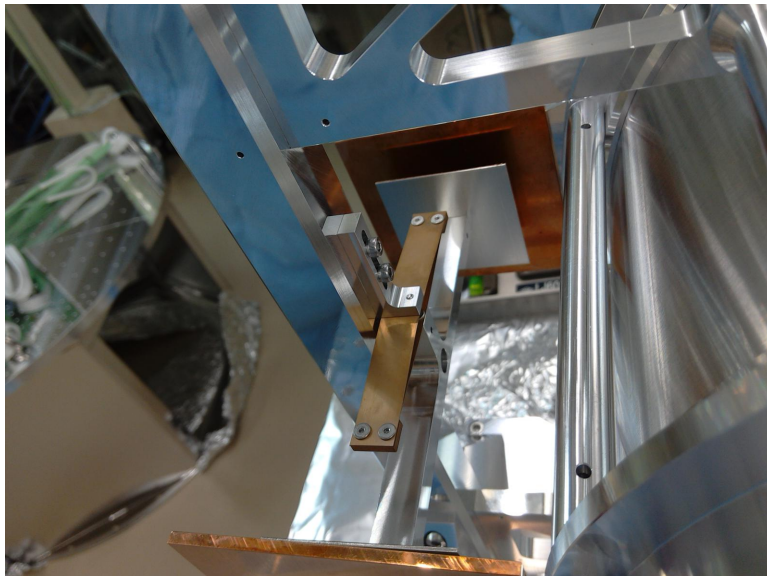
4. Damper (1 Person)

The two damper suspensions have to be assembled outside the WAB suspension first. After that, they can be placed on their positions on the suspension support structure beams.

The actual assembly of the dampers is relatively simple and straight forward (please refer also to the Suspension Damper Assembly document):

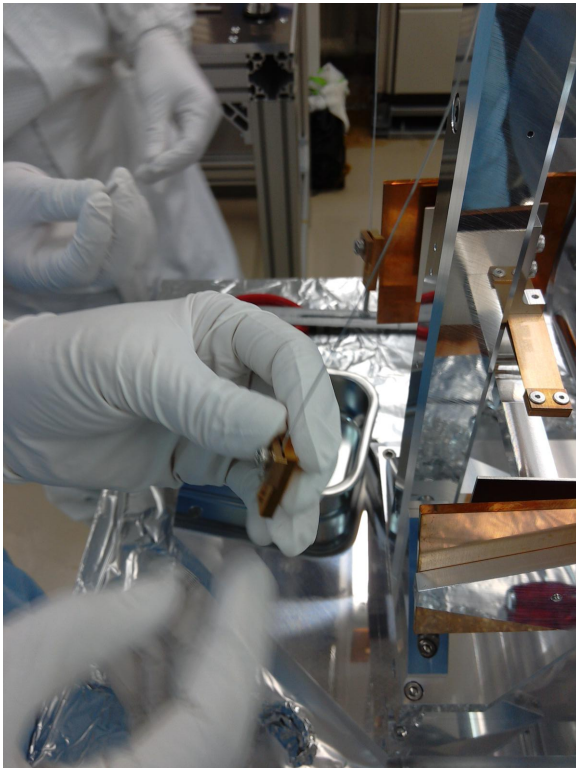
- Take the Suspension Damper Mount Bracket and screw a Suspension Damper Plate Spring on its bottom side (use CBSTSR ultra low head cap screws for that)
- Do the same for the Suspension Damper T-Beam only that the spring-plate needs to be screwed on its top
- Screw the ends of each spring-plate on the bracket and T-beam to its counterpart; use the Suspension Damper Plate Retainers for that by setting them so that the spring-plates are squeezed between them
Note: there are two different retainers, one is threaded (and bigger) and the other one thinner and non-threaded. The threaded one is to be set on the bottom and the non-threaded one on top!
Also here, use the CBSTSR screws!
- Screw the two Suspension Damper Magnet Base Plates on each side of the “T” with the SFBJ flat head screws
- (?) Set the magnets to their supposed places on the Suspension Damper Magnet Base Plates

After assembly of the dampers, screw them on the suspension support structure beams.



5. Hanging (2-3 Persons)

- On the Suspension Blade Spring Anchor Block, mount the Suspension Blade Springs (use M5x15* screws)
- *wing end points...*
- Take one of the wires and mount to its end the Baffle Wire Anchor (place the wire in the groove of the Baffle Wire Anchor Mirror and fix it by screwing the Baffle Wire Anchor Washer to it)
- Do the same with the other three wires*
- *wire connector*
- *wire assembly to the wing blade*
- Mount the Baffle Wire Anchors to the end point of each Baffle Wing Plate
Note: it might be necessary to lift the whole baffle structure for that or to push the wing blades down; a second or a third person is needed!



6. Adjustment

Setting-up the adjustment of the WAB is one of the most crucial things as a misaligned baffle may reduce significantly the purpose of the WAB.

However, not all of the degrees of freedom (DoF) are crucial to the influence of back-scattering or diffraction of the main-beam in KAGRA.

The most important DoF are the “Yaw”, the Y- and the Z-direction (X marks the direction of the main-beam, Z is vertical).

Note:

- If we stick to Obuchi-san’s new design of how to hang the baffle, the “Roll” and especially the “Pitch” DoF may be not significantly misaligned as the length of each wire cannot vary as much as it would before.
- In the current design (if the wires are all of the same length), the X and Y position of the baffle is not a real DoF. Instead, there are a X- and Y-pendulum DoF because of the stiffness of the wires.

Alignment of the baffle should be finished if the center of the baffle is 26.8cm (considering 27cm as working-height in the cryostat @20K) above the ground with the EQ-stopper in equal distance to the flanges around the baffle and the baffle itself.

An Offset in the X-pendulum, “Roll”, and Z DoF can be set with the three-head adjustment stage on the Suspension Yaw Adjuster Boss Block which itself controls the offset in “Yaw”.

The X-Y translator stage controls the X- and Y-position’s offset of the baffle itself.